# Case Study: Effects of Shutting Down a Pump & Treat System at Air Force Plant 4

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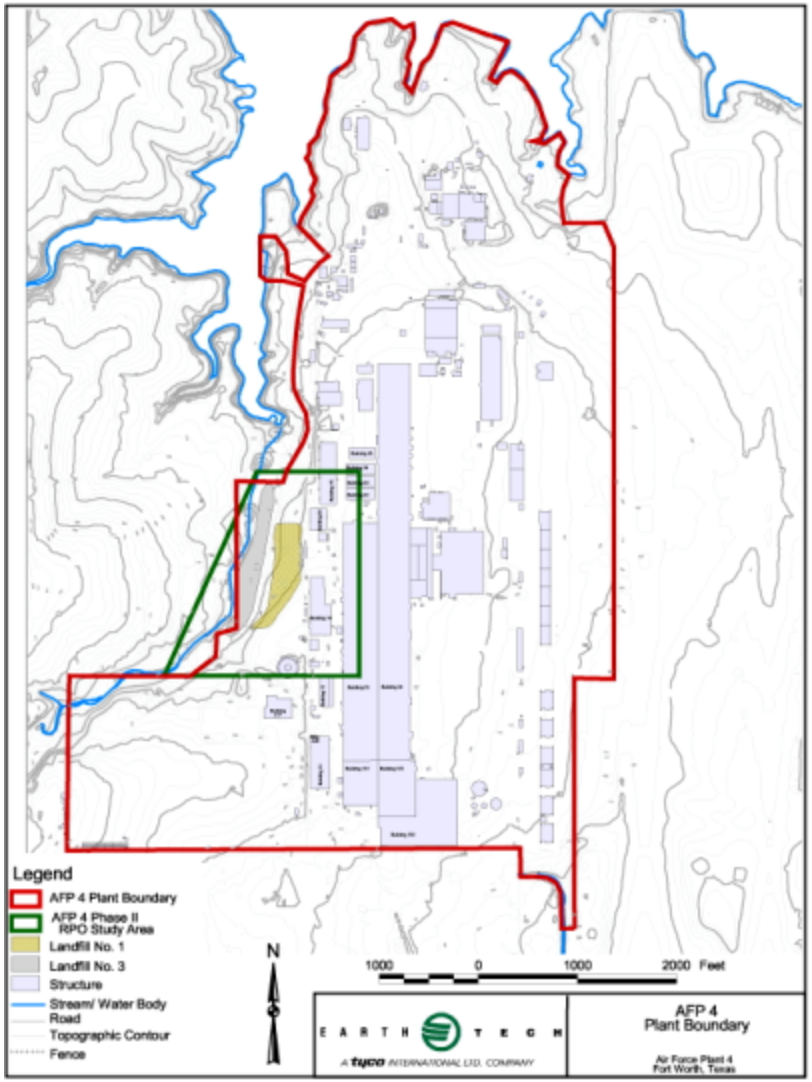
# Phase II RPO Evaluation

- **Objective**
  - **Evaluate the effectiveness, efficiency, and optimization opportunities for the Landfill No. 3 system**
- **LF-3 VEP System**
  - **Voluntary remedial action**
  - **Goal: Prevent groundwater seeps along cliff face**
  - **Dual-phase extraction system (48 VEP extraction wells)**
  - **Treatment:**
    - **Liquids: Air stripping with liquid-phase carbon polishing**
    - **Air: Vapor-phase carbon**

# LF-3 System Location & Layout



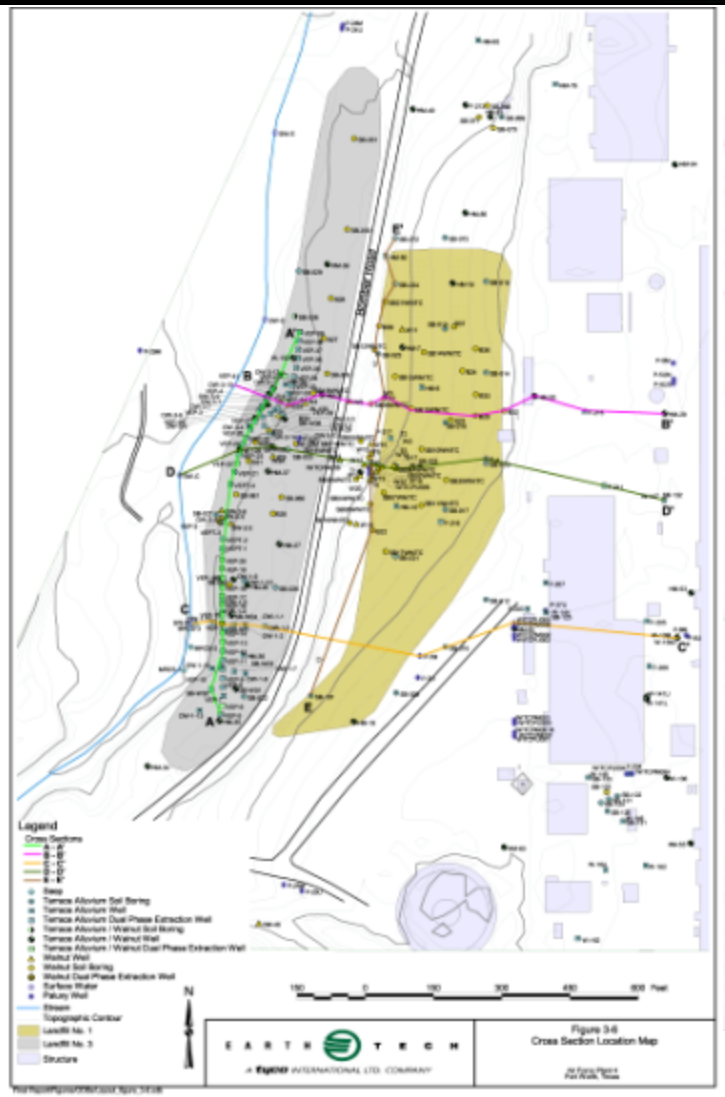

# Seep Face Photo

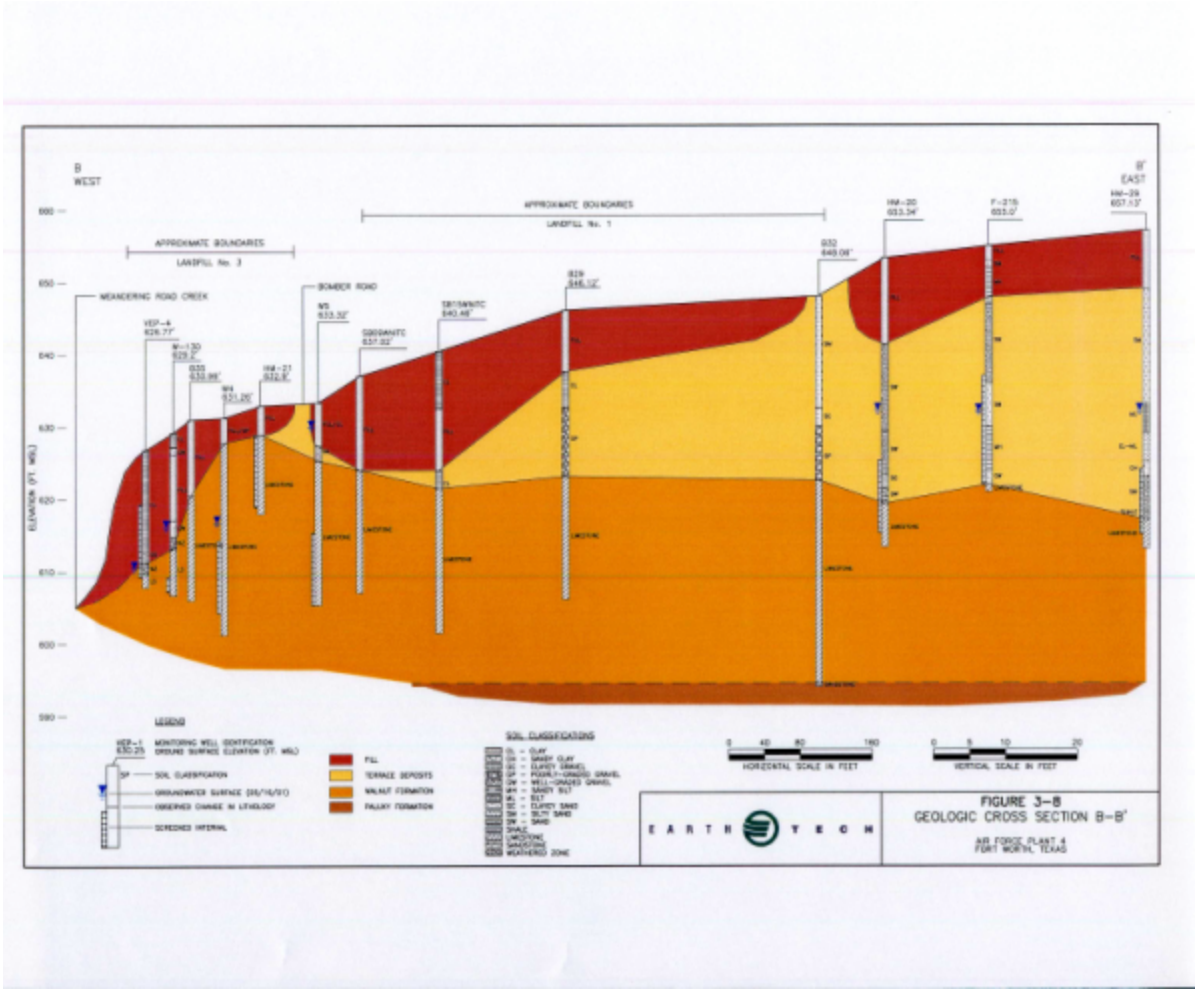
- Seep face looking northeast
- February 26, 2001 sample
  - TCE = 2.6J ppb
  - cis-1,2-DCE = 0.92J ppb

# RPO Fieldwork

- **April 2001:**
  - **Water level measurements**
  - **DNAPL thickness measurements**
  - **Air flow rate measurements**
  - **Air and water quality samples**
- **Immediately following the April 2001 fieldwork**
  - **Shut down the LF-3 system**
- **Monthly following system shut down**
  - **DNAPL thickness measurements**
  - **Seep and creek samples**

# Conceptual Site Model



# LF-3 System Effectiveness

- System does not achieve remedial objective
- System does not prevent contamination in seeps
  - Removes some mass in the northern and southern areas
  - Limits contamination in seeps
- Limited ability to extract water from northern area
- Extracts water from southern area, but:
  - Extracts from wells with little or no contamination
  - Less recovery than expected
  - May cause cross contamination
- Potentially pulls DNAPL/dissolved-phase contamination towards plant boundary
- Meets surface water and air discharge requirements

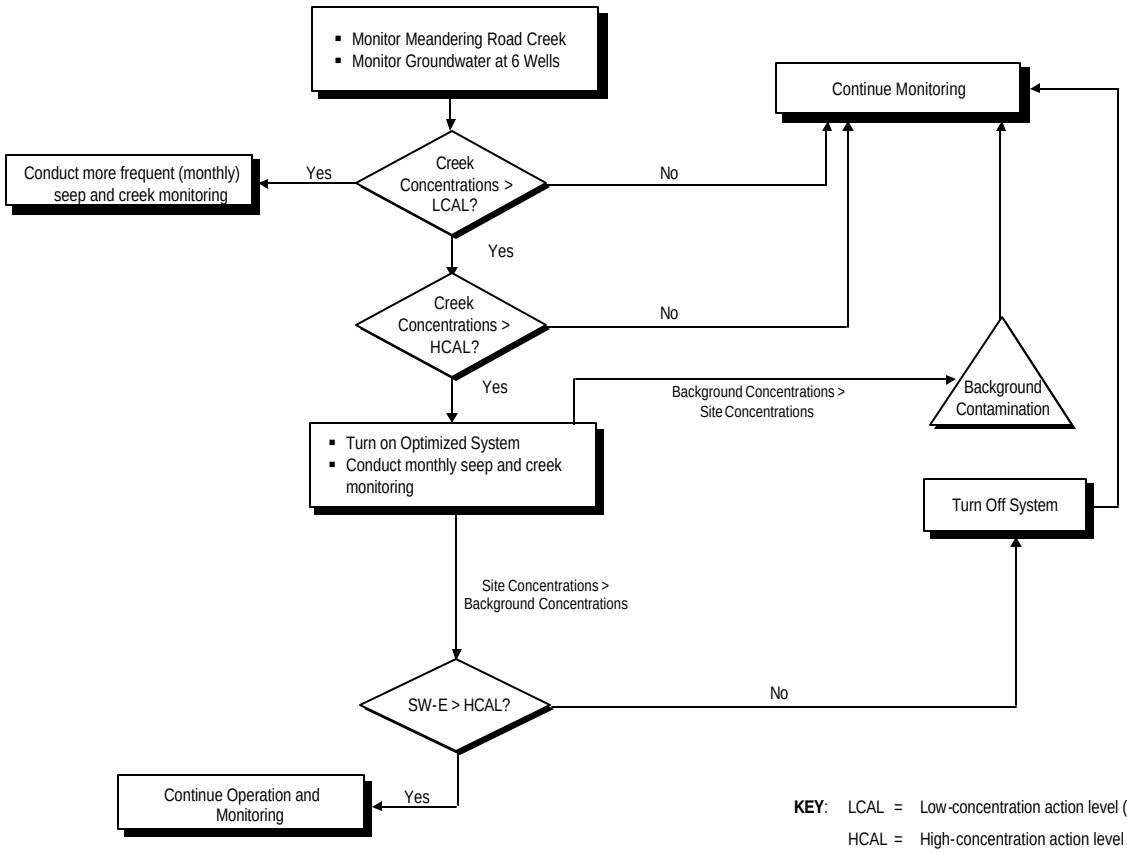
# LF-3 System Efficiency

- >$300,000/year to operate
- Unnecessary to extract water/vapor from the central/trench area
- Groundwater:
  - Higee air stripper is inefficient:
    - High electrical cost
    - Most contamination is transferred to vapor and treated by vapor-phase carbon
- Vapor:
  - Potassium permanganate impregnated resin beds necessary?
  - High temperatures and relative humidity in the vapor stream reduces adsorption capacity of carbon units
  - Could discharge vapor directly to atmosphere
  - Vapor extraction necessary?

# LF-3 System Optimization

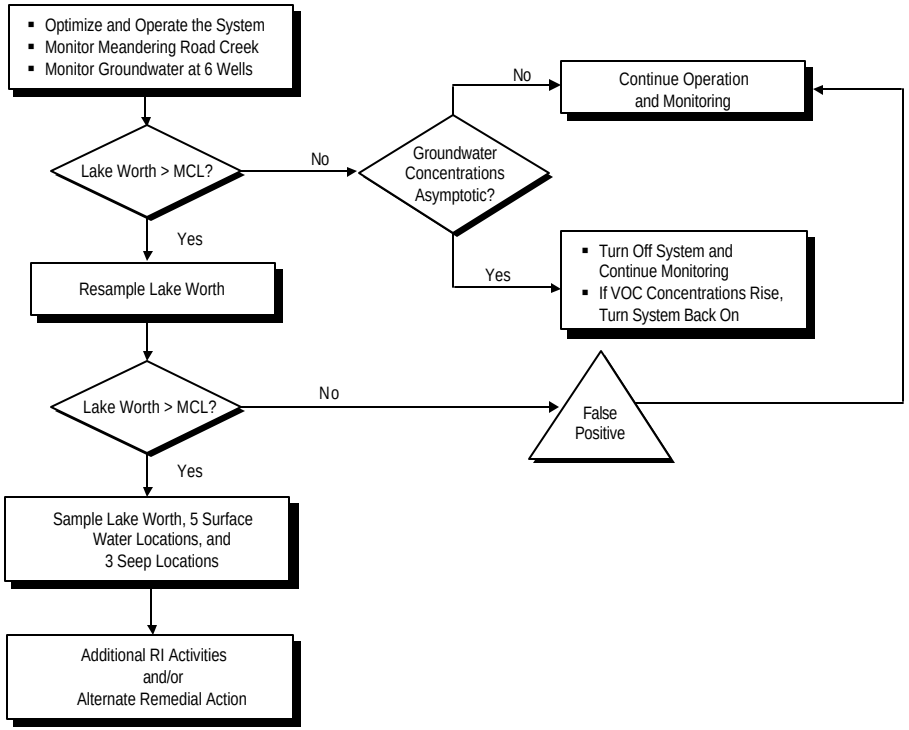
- **Re-pipe the LF-3 system so that water is only extracted from wells that have elevated VOC concentrations and sufficient saturated thickness**
  - **Focuses remediation**
  - **Decreases volume of water through the system**
- **Replace liquid-ring pumps with pneumatic pumps**
  - **Benefits of pneumatic pumps:**
    - **Only treats groundwater (no vapor phase)**
    - **Less maintenance**
    - **Lower operating costs (electrical)**
    - **Depth to water not an issue**
- **Bypass the Higee air stripper (re-utilize at another facility?)**
- **DNAPL Extraction:**
  - **Extract DNAPL from all Walnut wells with a DNAPL thickness exceeding 0.5 feet**
  - **Extract DNAPL from all Terrace wells**

# Operating Option 1 Flowchart




**Flowchart for Option 1 (Keep the System Down)**

# Operating Option 2 Flowchart




**Flowchart for Option 2 (Optimize and Operate the System)**

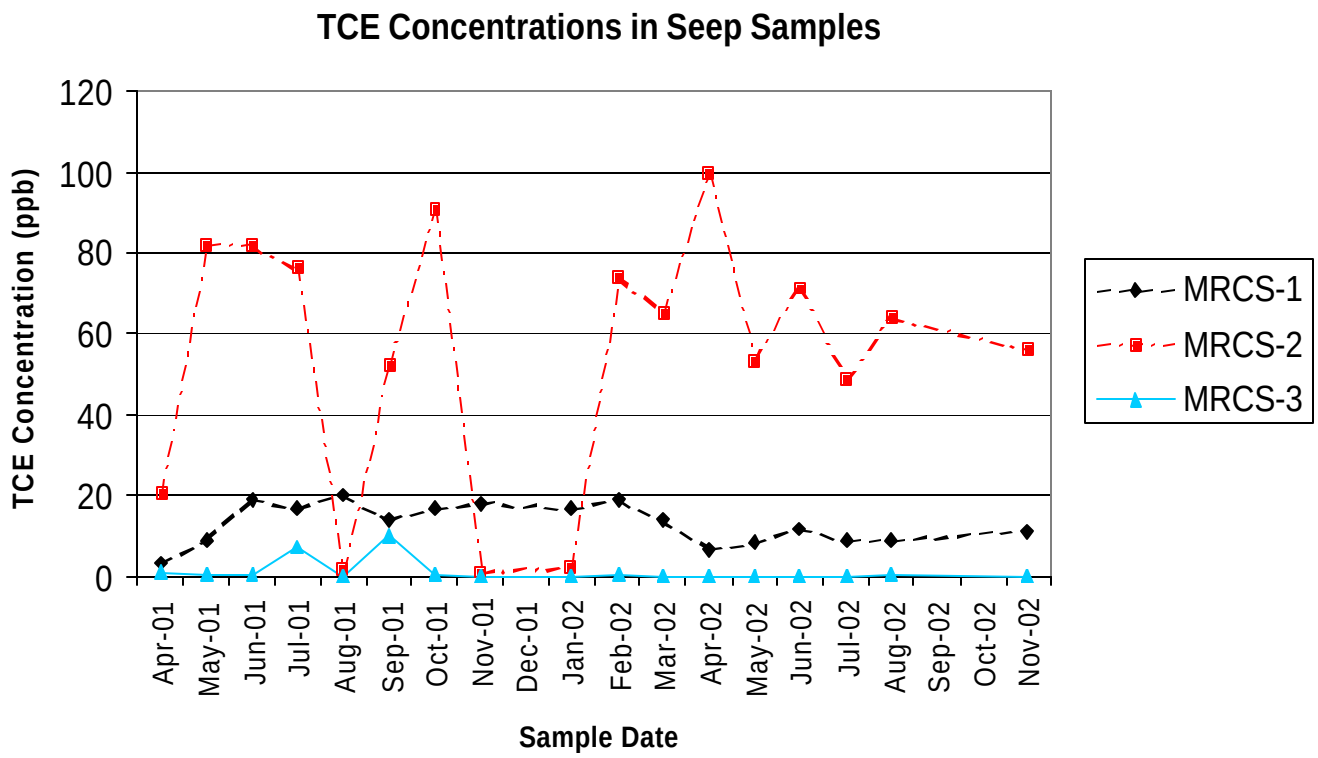
# Recommended Option: Option 1

- **Establishes decision rules for system operation.**
- **If action levels are exceeded and the system must be operated, allows for a more focused remediation effort.**
- **When down, the system can not pull dissolved and/or DNAPL contamination toward the system and plant boundary.**
- **Eliminates O&M costs ($335,000/year) associated with the system (unless high-concentration action levels are exceeded).**
- **If high-concentration action levels are exceeded and the system must be operated, O&M costs would be greatly reduced (e.g., lower electrical costs) through the optimization of the system.**
- **FSA-1 system will continue to operate and capture Terrace Alluvium contamination.**
- **Meets the requirements of the ROD.**

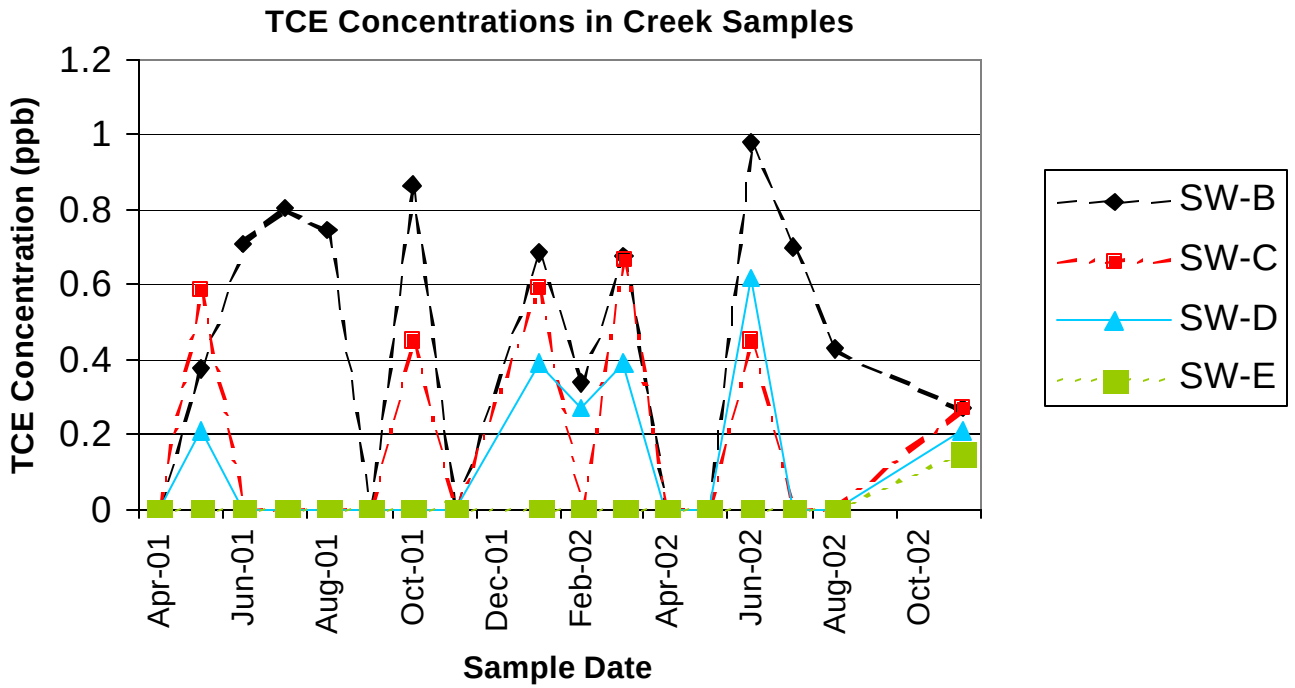
# Data Collected Since Phase II RPO

- **Seep and creek data (Shaw E&I)**
  - **Collected on monthly basis**
    - **3 seep locations**
    - **6 creek locations**
- **Groundwater data (Earth Tech)**
  - **May 2002: Sampled 41 of 48 VEP wells**
  - **October 2002: Sampled 6 of 48 VEP wells**

# Seep Data


TCE Concentrations in Seep Samples
TCE Concentration (ppb)
120
100
80
60
40
20
0
Apr-01
May-01
Jun-01
Jul-01
Aug-01
Sep-01
Oct-01
Nov-01
Dec-01
Jan-02
Feb-02
Mar-02
Apr-02
May-02
Jun-02
Jul-02
Aug-02
Sep-02
Oct-02
Nov-02
Sample Date
MRCS-1
MRCS-2
MRCS-3

# Creek Data


TCE Concentrations in Creek Samples
TCE Concentration (ppb)
1.2
1
0.8
0.6
0.4
0.2
0
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Sample Date
SW-B
SW-C
SW-D
SW-E

# Groundwater Data

- **Data confirms nature and extent of VOC contamination (defined in RPO Report)**
  - **VOC distributions and concentrations were similar**
- **Data support decision to shut down the LF-3 system**
  - **VOC concentrations have remained relatively constant since the system was shut down**

# Conclusion

- **Based on RPO Report and subsequent seep, creek, and groundwater data, the LF-3 system remains down**

- **USAF continues seep, creek, and groundwater monitoring**